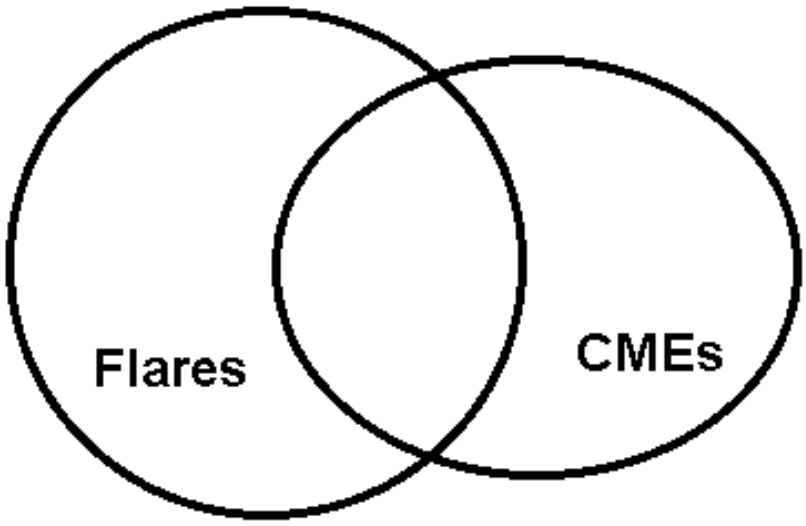
Solar flares are violent releases of energy from the sun that last 10 to 20 minutes and produce intense flashes of x-rays, which travel at the speed of light to Earth. Coronal mass ejections (CMEs) are enormous releases of matter (plasma) from the sun that travel at nearly a million miles per hour to Earth. When a CME is directed towards Earth it is called a **Halo CME** because the sun looks like it is surrounded by a halo of glowing gas. We know that only CMEs cause the Northern Lights because of the way that they affect Earth's magnetic field. The question we want to answer is, 'Do flares cause CMEs to happen, or vice versa?

A scientist named Dr. C. A. Flair is trying to decide if there is a relationship between CMEs and flares by studying how many of these events occur, and how often CMEs and flares coincide. He has created the following list:

Solar Flares	22
Halo CME	**12**
Both Flares and Halo CMEs	**7**

The scientist decides to analyze the results. His first step is to construct a Venn Diagram to display the data. Place the data in the correct locations.



Question 1 - What is the total number of individual events involved in this sample?

Question 2: What does the overlapping part of the diagram represent?

Question 3 - Based on this data, what is the probability of a flare occurring?

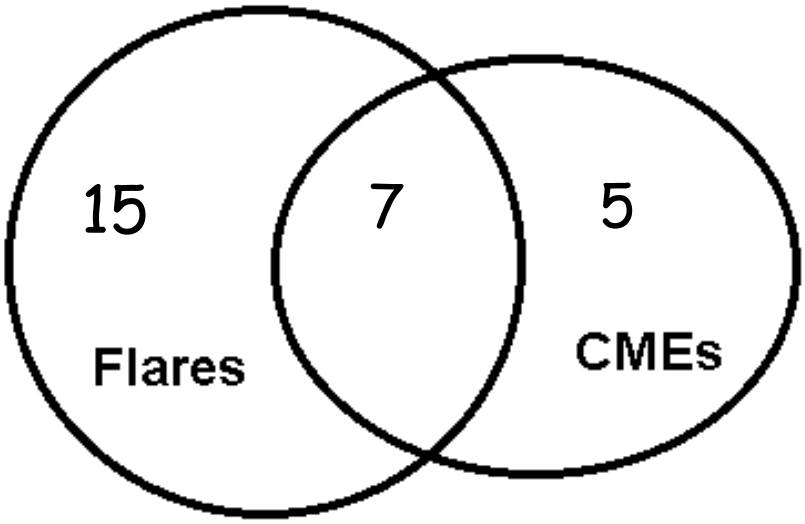
Question 4 - What is the probability of a CME Halo occurring?

Question 5 - What fraction of the time do flares and a CMEs occur at the same time?

Question 6 - In your own words, what would be your answer to the question?

Answer - Extra Credit Problem 4

Answer



Question 1 - What is the total number of individual events involved in this sample?
Answer: There are 22 flare events, 12 CME events and 7 combined events for a total of 41 solar 'storm' events of all three kinds.

Question 2 - What does the overlapping part of the diagram represent?
Answer: It represents the number of events where both Halo CMEs and solar flares are involved in a solar storm.

Question 3 - Based on this data, what is the probability of a flare occurring?
Answer: Out of the 41 events, a flare will occur with a probability of (22/41) x 100% = 53.7 % of the time.

Question 4 - What is the probability of a CME Halo occurring?
Answer: Out of the 41 events, a CME will occur (12/41) x 100% = 29.3%

Question 5 - What fraction of the time do flares and a CMEs occur at the same time?
Answer: Of the 41 events, both flares and CMEs happen (7/41) x 100% = 17.0% of the time.

Question 6 - In your own words, what would be your answer to the question?
Answer: Solar flares hardly ever occur at the same time as CMEs (17% of the time) and so the reason that CMEs happen probably doesn't usually have anything to do with solar flares.